

Proc. NIPR Symp. Polar Meteorol. Glaciol., **11**, 261, 1997

**RAPID VARIATIONS OF OZONE ALTITUDE PROFILE OBSERVED WITH
THE TUNABLE DIODE LASER HETERODYNE SPECTROMETER
AT SYOWA STATION IN 1994 (ABSTRACT)**

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With the improved tunable diode laser heterodyne spectrometer (TDLHS-3), we observed stratospheric ozone, nitrous oxide, methane and nitric acid at Syowa Station (69.0°S, 39.6°E) from August 1994 to January 1995. From the analysis of observed ozone and nitrous oxide spectra, their altitude profiles in the lower to middle stratosphere were retrieved with a time resolution of 10 min. On September 26 and October 14, 1994, rapid variations of ozone altitude profiles were obtained. To investigate the causes of these rapid variations, we made potential vorticity maps over the Antarctic using objective data provided by the Japan Meteorological Agency. Such maps clearly showed that the polar vortex had fine structures, and that the rapid variations of ozone were caused by the wavy structures of the polar vortex. Especially, when Syowa Station was located almost just under the polar vortex boundary on October 14, 1994, an eastward-moving wavy structure with a wavelength of about 1000 km passed above Syowa Station, moving very fast (40-50 m/s wave propagation velocity). On September 26, a similar wavy structure was seen near Syowa Station, though the polar vortex was still covering the entire Antarctic. The observed rapid ozone variations on this day could be due to penetration of air from outside of the polar vortex to inside.

(Received January 22, 1997; Revised manuscript accepted January 28, 1997)

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**TEMPORAL AND SPATIAL FLUCTUATIONS OF WARMING IN
ANTARCTICA AND THE ATMOSPHERIC CIRCULATION (ABSTRACT)**

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An abrupt and extreme warming was observed in the mid-winter season, in June 1994. The air temperature increased from -72°C to -36°C in two days. This warming caused reduced cooling of air temperature in the winter and hence resulted in increase of the temperature throughout a month. The area of warming and its temperature change were analyzed by using the passive microwave radiometer (DMSP SSM/I) data. This area appeared first in the coastal region around the Lambert Glacier, East Antarctica and expanded to the inland areas over Dome Fuji, then diminished over the Dome C area. The weather chart showed a high pressure area over East Antarctica, and advection of air from the coastal region to the inland areas of Antarctica. A blocking of high pressure was detected in the higher troposphere and persisted for several weeks. The seasonal variations of the polar vortex in the stratosphere (30 hPa) showed a westward shift of the center area in the corresponding period. This event is important to understand the Antarctic climate and also exchange processes of polar air masses.

(Received December 10, 1996; Revised manuscript accepted January 28, 1997)